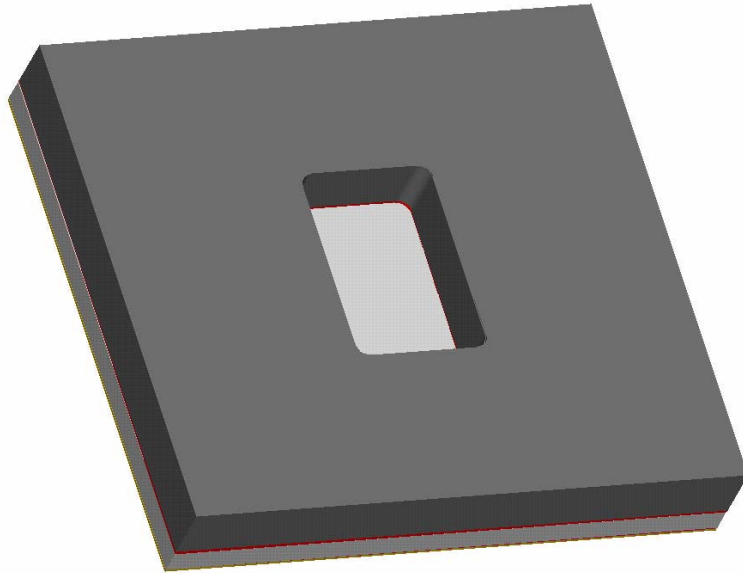


# LBNL CCD Blade Mount Initial FEA Results

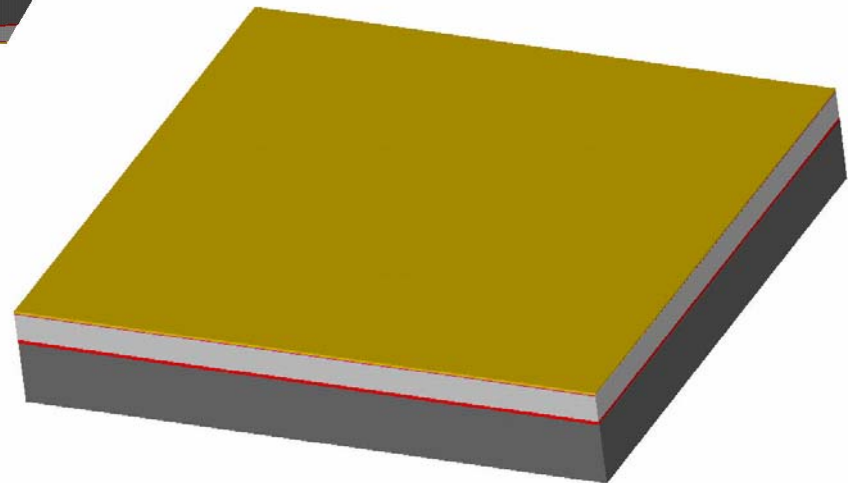
Dan Cheng  
LBNL

- **Started with the “Yale Mount”**
  - Used Invar-36 base and AlN substrate
- **Added the blade mount**
  - 6-mm dia., 1-mm thick at narrowest point, 3-mm thick otherwise
  - 10-mm distance between narrowest regions
  - 16-mm total gap distance between Invar-36 and Moly coldplate

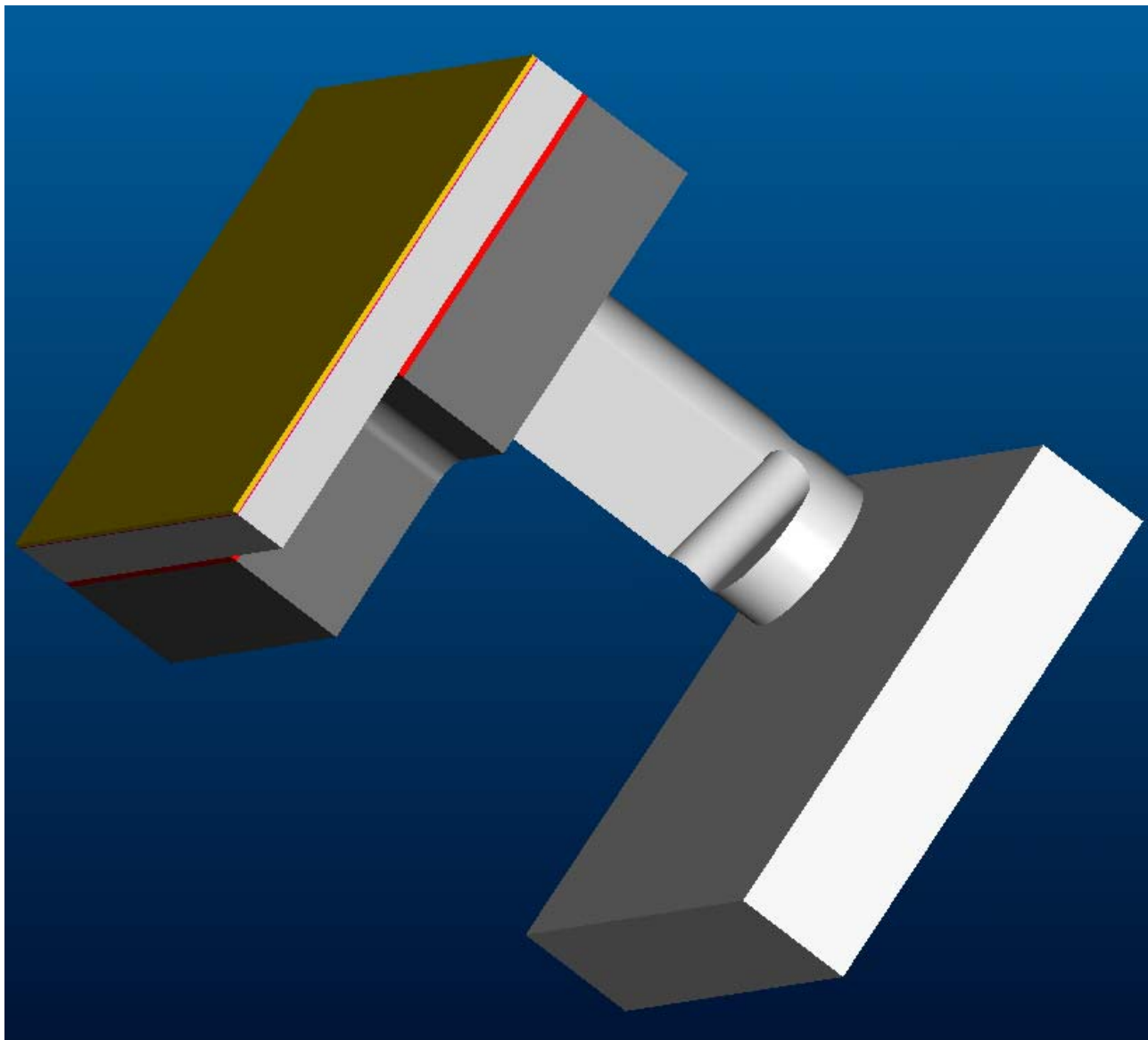
Rear View

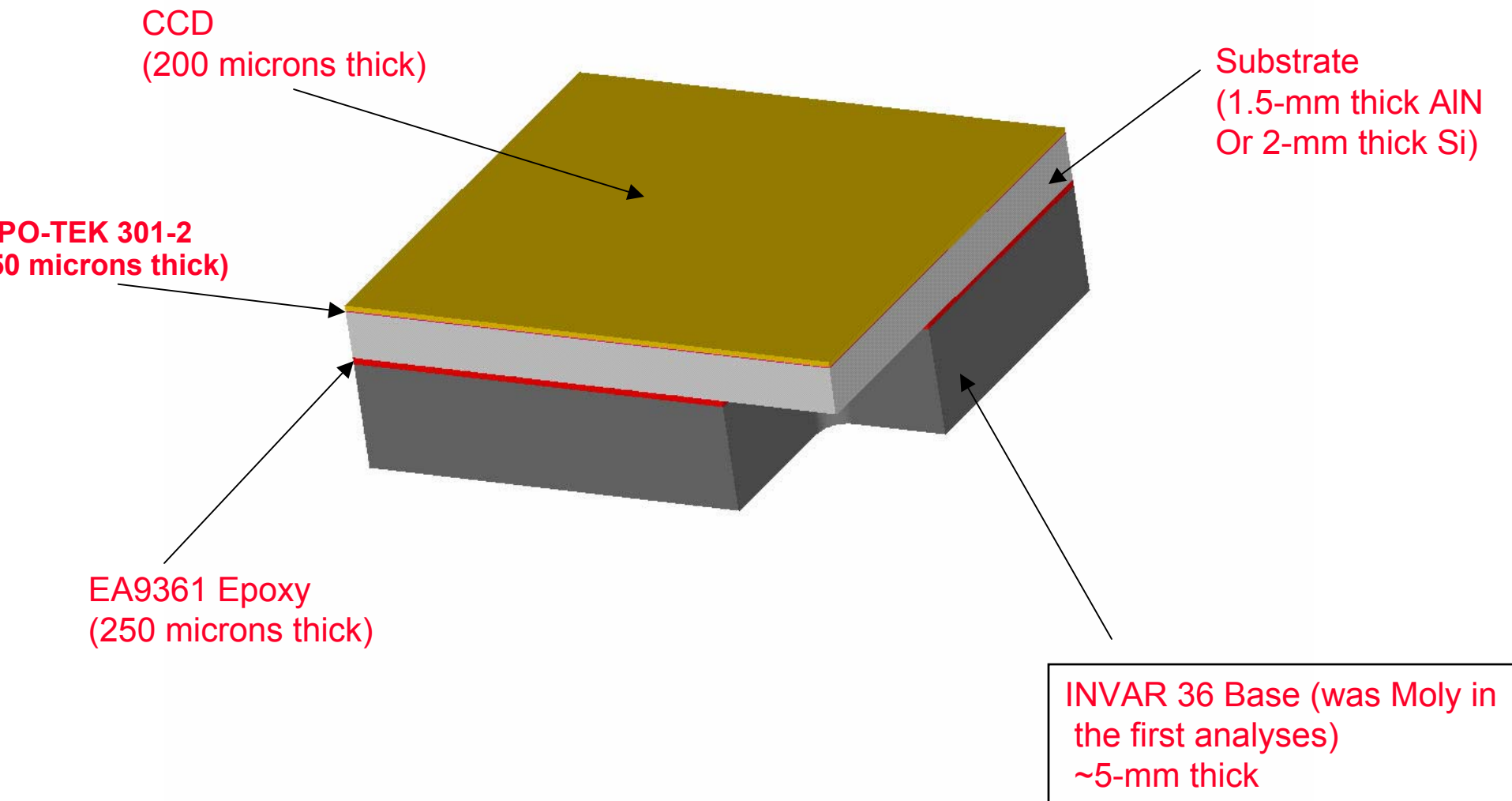


Front View

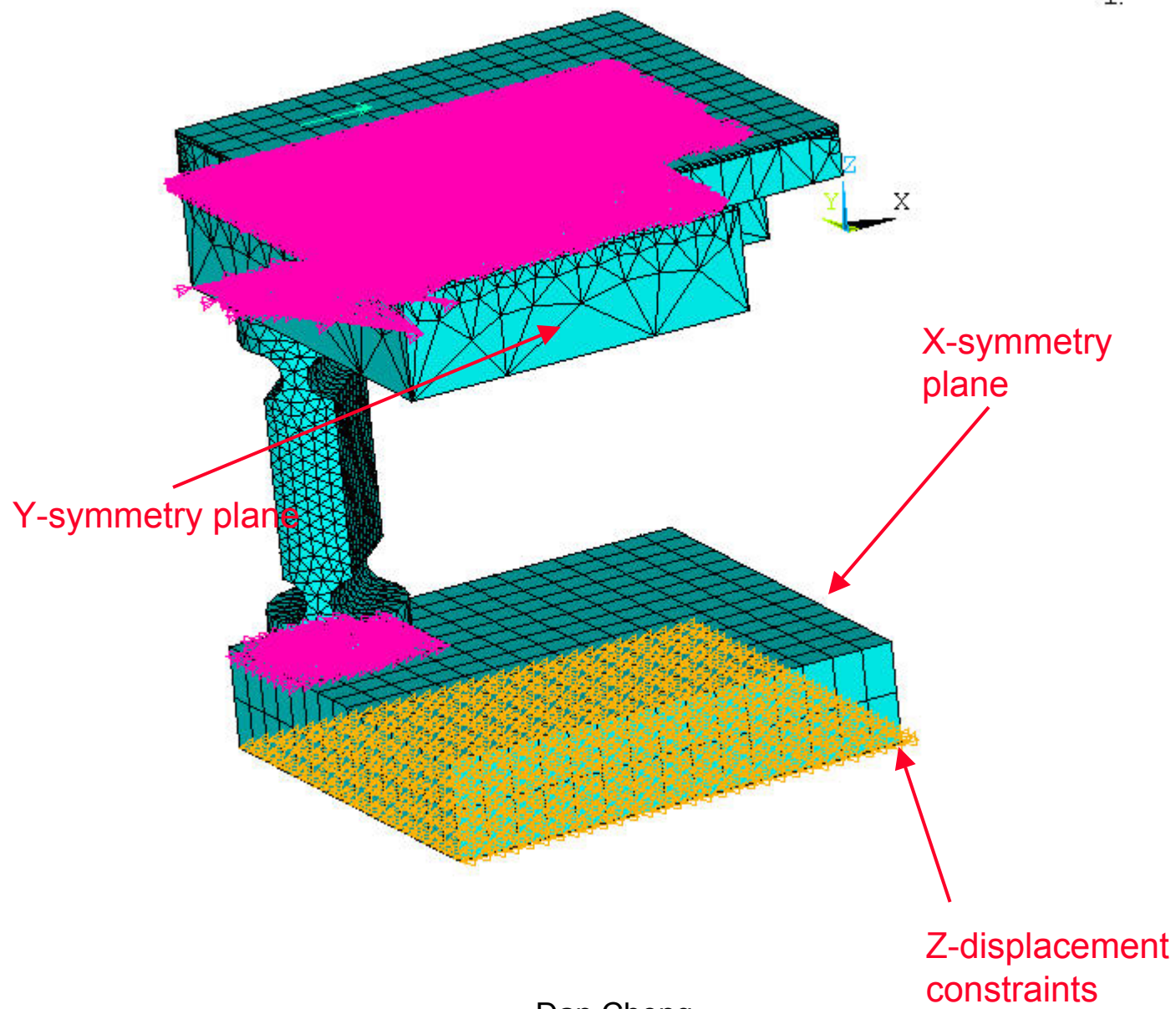








1.



- Quarter-symmetry model
  - Approximately **22,000** elements
- Temperature boundary constraints
  - Bottom surface of moly held at 140 K
- Most material properties are temperature-dependent
  - With the exception of some Young's Modulus numbers
  - Used numbers from Touloukian (via Don Groom)
  - Used Carpenter's numbers for Invar 36 material



- Quarter-symmetry model
  - Approximately **22,000** elements
- Symmetric boundary constraints
  - X- and Y- symmetry planes fixed, allowed to “slide”
  - **Z displacement constrained at center (corner) of the moly plate**
- In reality, there’s a hole in the moly coldplate for the cabling, etc.

- **Moly coldplate support**
  - No hole through the moly coldplate
- **Did not model Gold/Indium bump bonds**
- **Reference Temperature for structural analysis is 293 K; analysis Temperature is 140 K**
  - Still does not take into account the thermal cycle of Epotek cure (at approximately 60 degrees Celcius)

1

NODAL SOLUTION

STEP=1

SUB =1

TIME=1

USUM (AVG)

RSYS=0

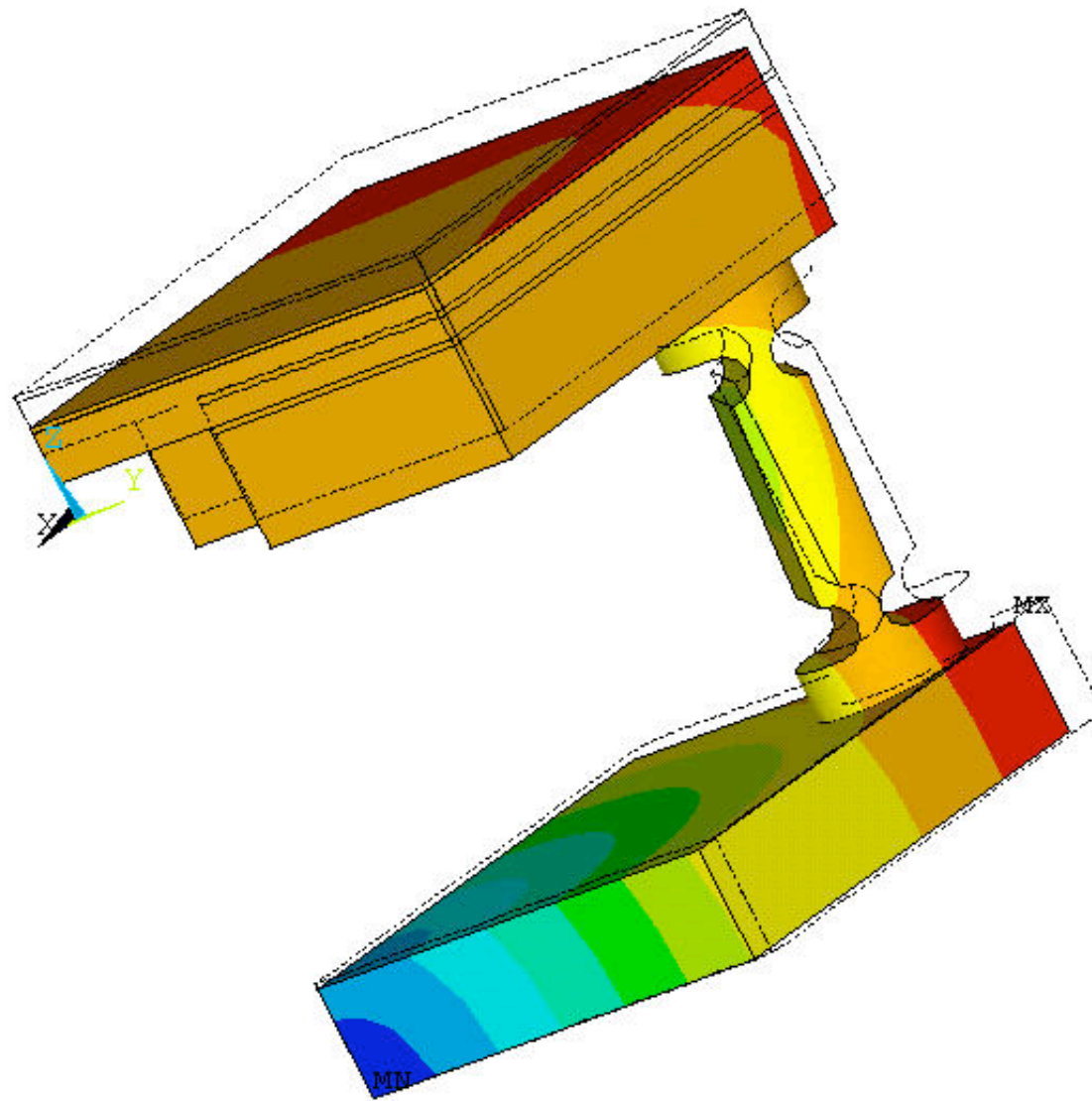
DMX =.020416

SMX =.020416

ANSYS

JUL 3 2003

09:56:55



Fully Supported AlN/Invar36 SNAP CCD Blade Mount, Quarter Symmetry w/Fillets

1

NODAL SOLUTION

STEP=1

SUB =1

TIME=1

UZ (AVG)

RSYS=0

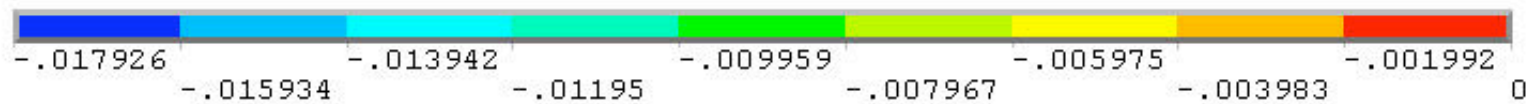
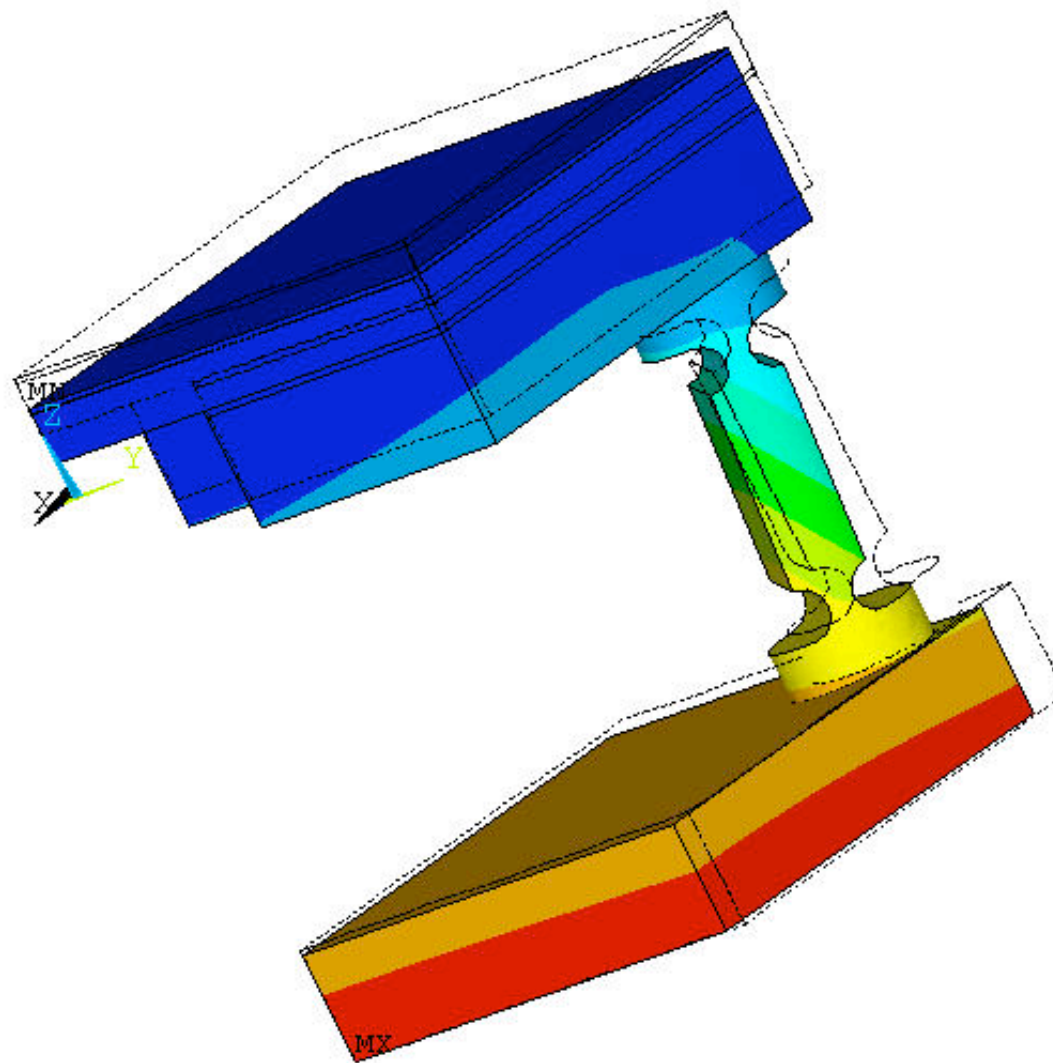
DMX =.020416

SMN =-.017926

ANSYS

JUL 3 2003

09:57:59



Fully Supported AlN/Invar36 SNAP CCD Blade Mount, Quarter Symmetry w/Fillets

1

NODAL SOLUTION

STEP=1

SUB =1

TIME=1

UZ (AVG)

RSYS=0

DMX =.019061

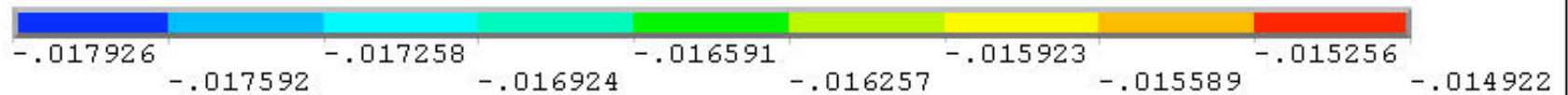
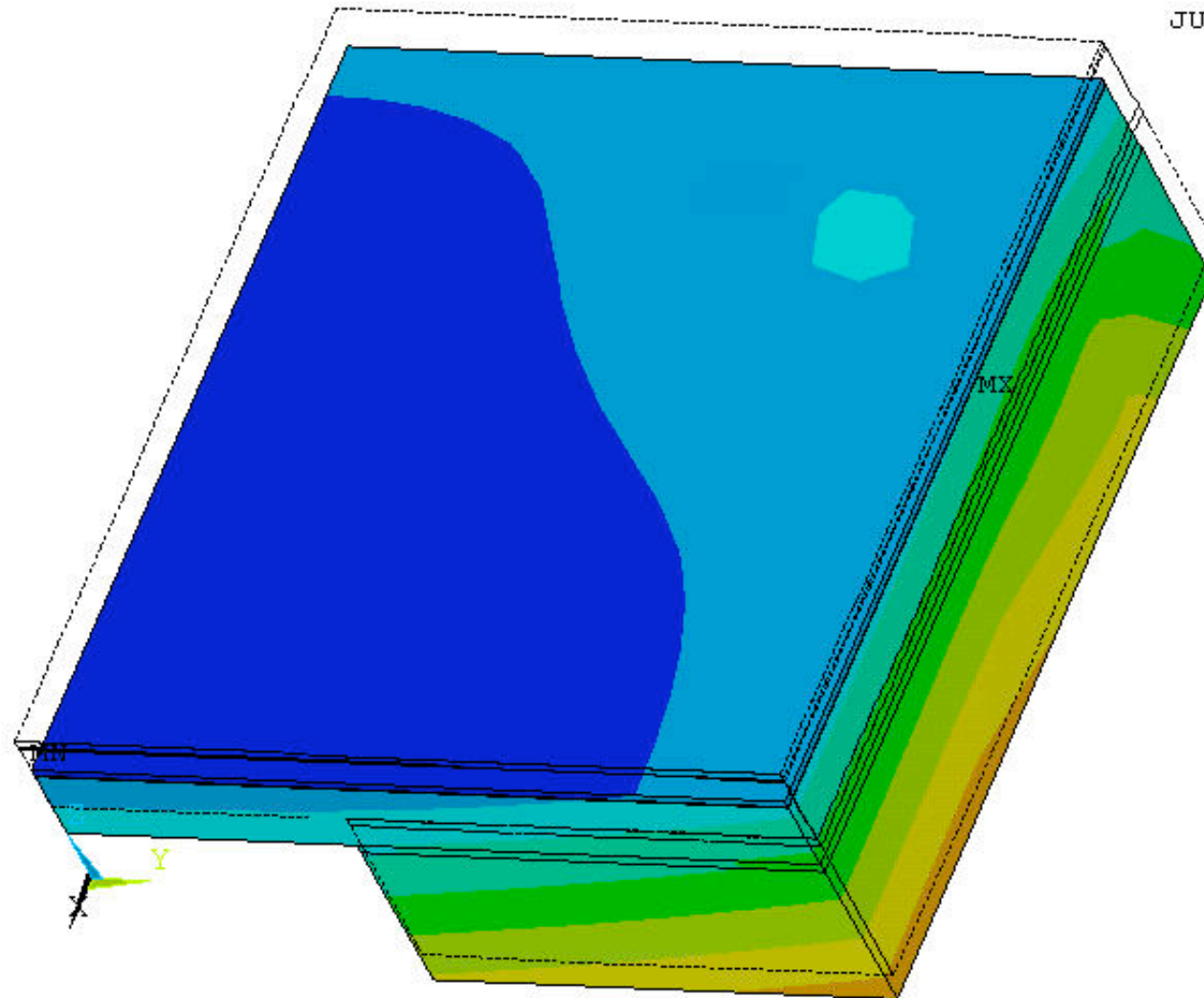
SMN =-.017926

SMX =-.014922

ANSYS

JUL 3 2003

09:58:42



Fully Supported AlN/Invar36 SNAP CCD Blade Mount, Quarter Symmetry w/Fillets

1

NODAL SOLUTION

STEP=1

SUB =1

TIME=1

SEQV (AVG)

DMX =.019061

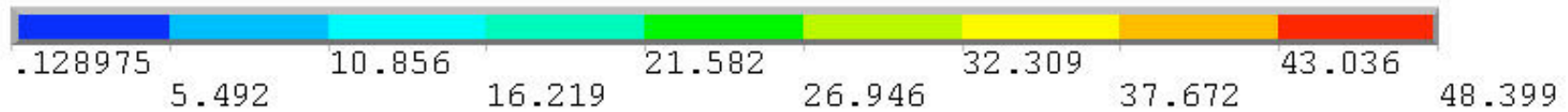
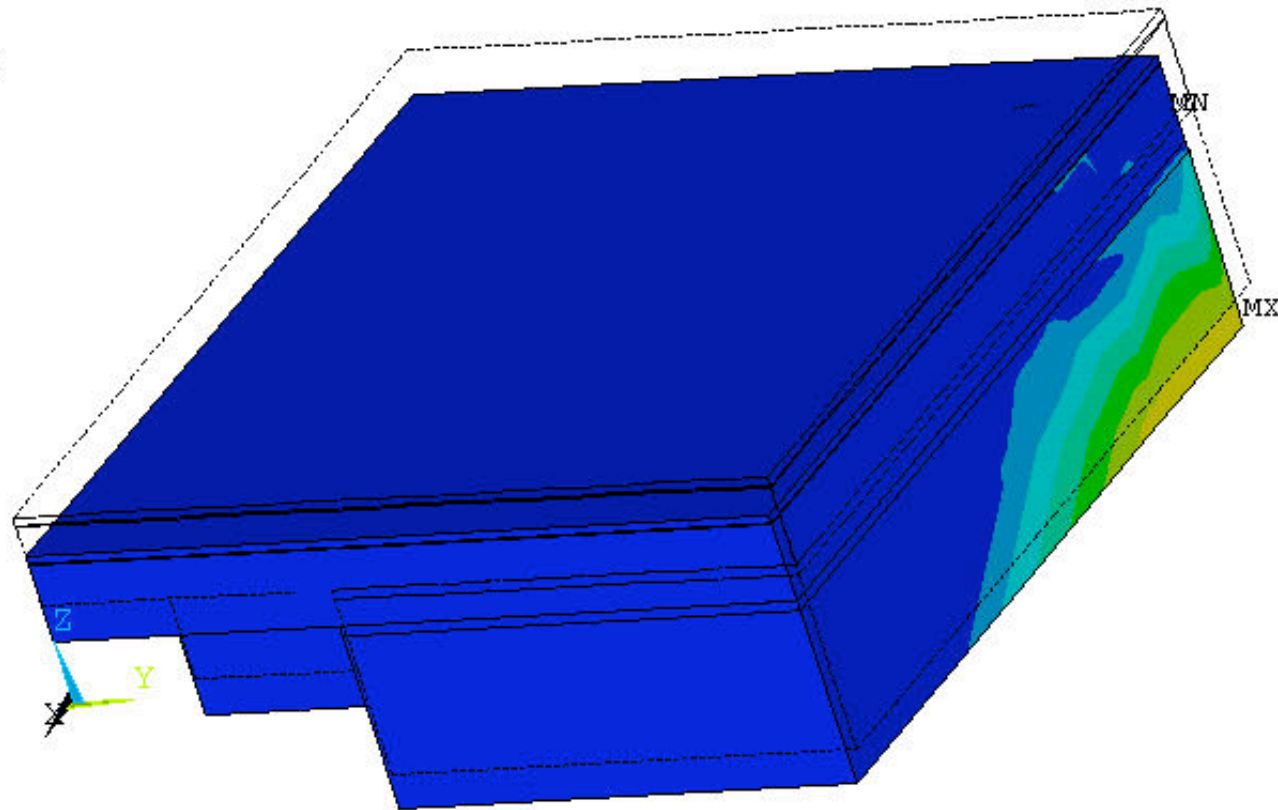
SMN =.128975

SMX =48.399

ANSYS

JUL 3 2003

10:00:36



Fully Supported AlN/Invar36 SNAP CCD Blade Mount, Quarter Symmetry w/Fillets



1

NODAL SOLUTION

STEP=1

SUB =1

TIME=1

SEQV (AVG)

DMX =.019061

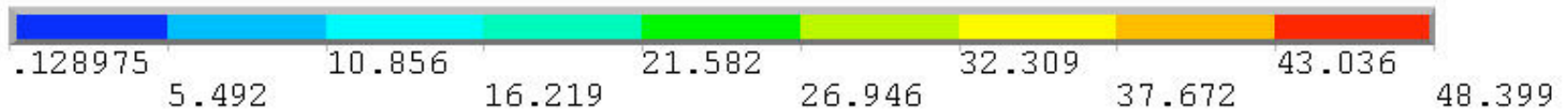
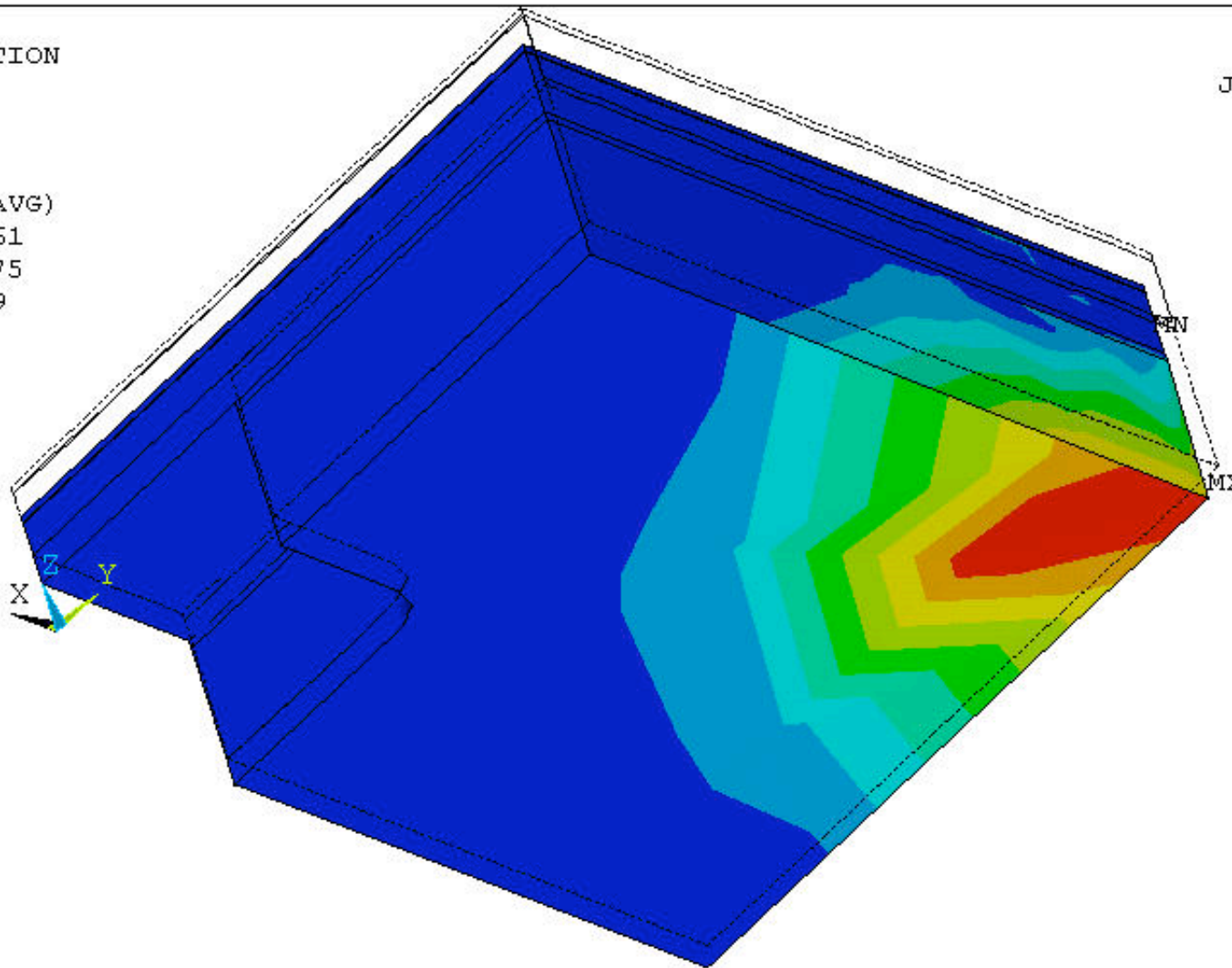
SMN =.128975

SMX =48.399

ANSYS

JUL 3 2003

10:00:47



Fully Supported AlN/Invar36 SNAP CCD Blade Mount, Quarter Symmetry w/Fillets

1

NODAL SOLUTION

STEP=1

SUB =1

TIME=1

SEQV (AVG)

DMX =.020416

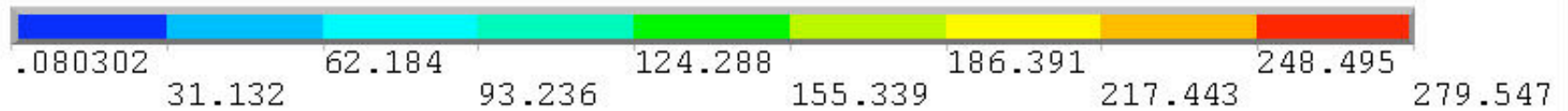
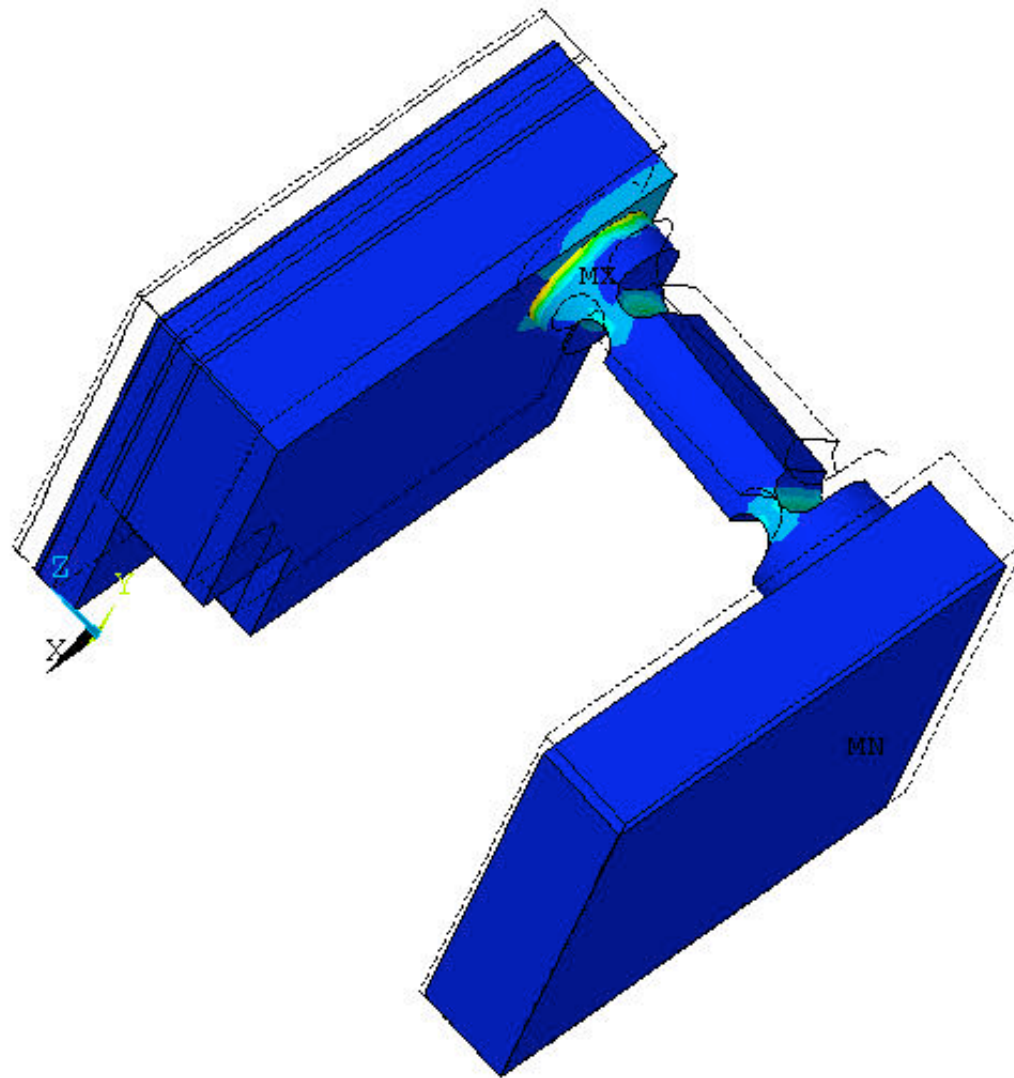
SMN =.080302

SMX =279.547

ANSYS

JUL 3 2003

10:01:37



Fully Supported AlN/Invar36 SNAP CCD Blade Mount, Quarter Symmetry w/Fillets



1

NODAL SOLUTION

STEP=1

SUB =1

TIME=1

SEQV (AVG)

DMX =.01924

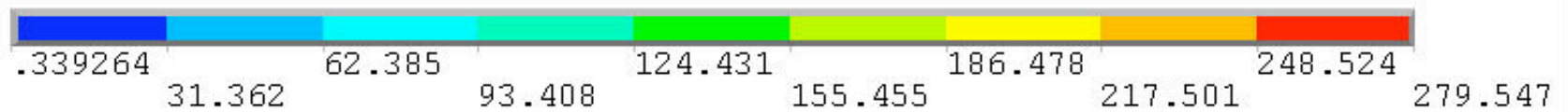
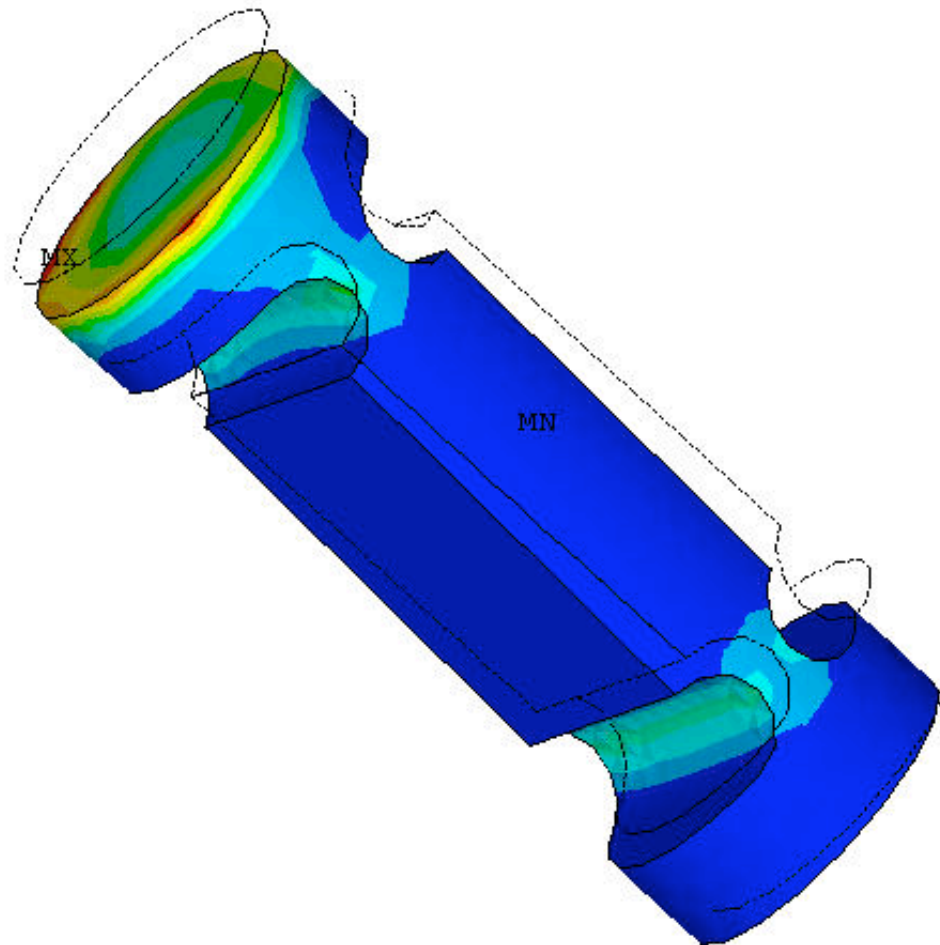
SMN =.339264

SMX =279.547

ANSYS

JUL 3 2003

10:02:33



Fully Supported AlN/Invar36 SNAP CCD Blade Mount, Quarter Symmetry w/Fillets

1

ELEMENTS

TEMP

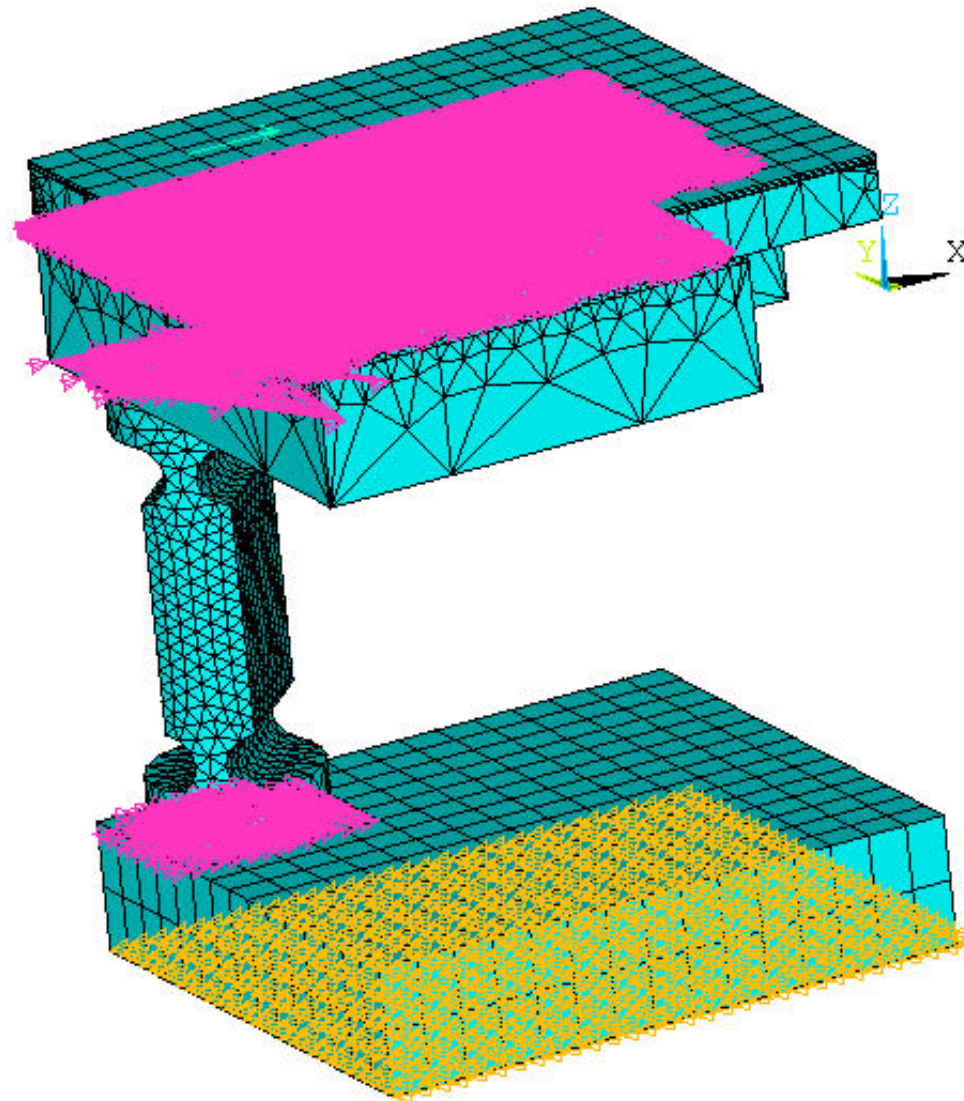
HEAT

CE

ANSYS

JUL 3 2003

11:19:57



Thermal AlN/Invar36 SNAP CCD Blade Mount, .01W, 140K

1

NODAL SOLUTION

STEP=1

SUB =1

TIME=1

TEMP (AVG)

RSYS=0

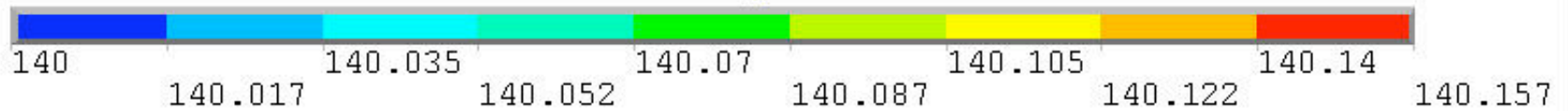
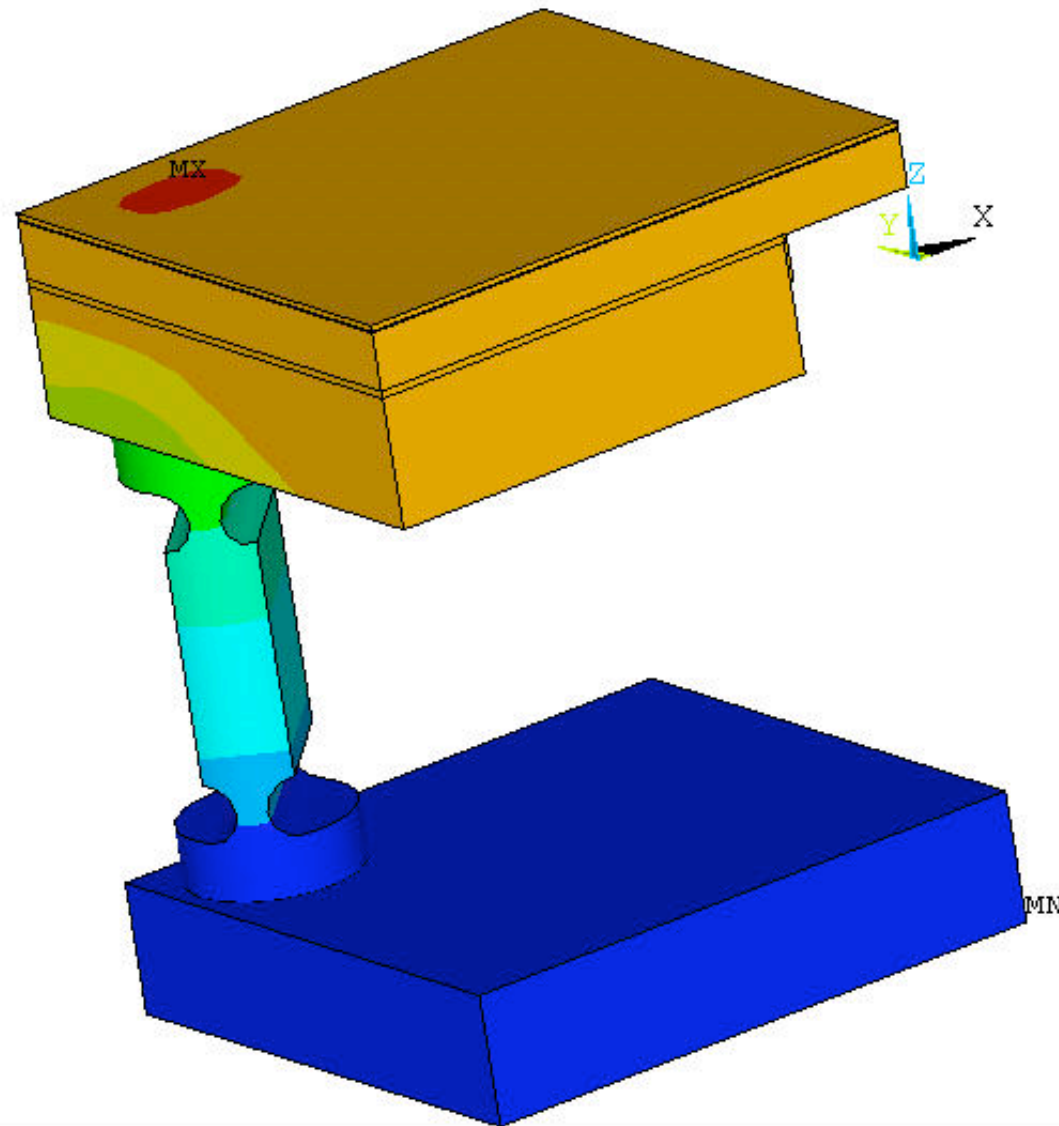
SMN =140

SMX =140.157

ANSYS

JUL 3 2003

11:32:09



Thermal AlN/Invar36 SNAP CCD Blade Mount, .01W, 140K

1

NODAL SOLUTION

STEP=1

SUB =1

TIME=1

TGSUM (AVG)

RSYS=0

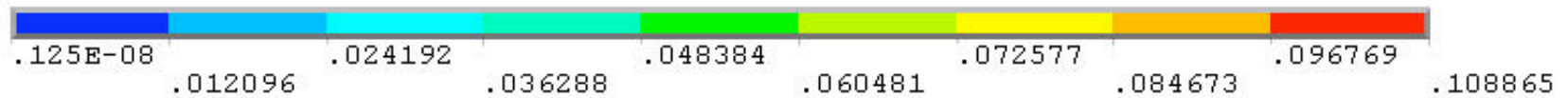
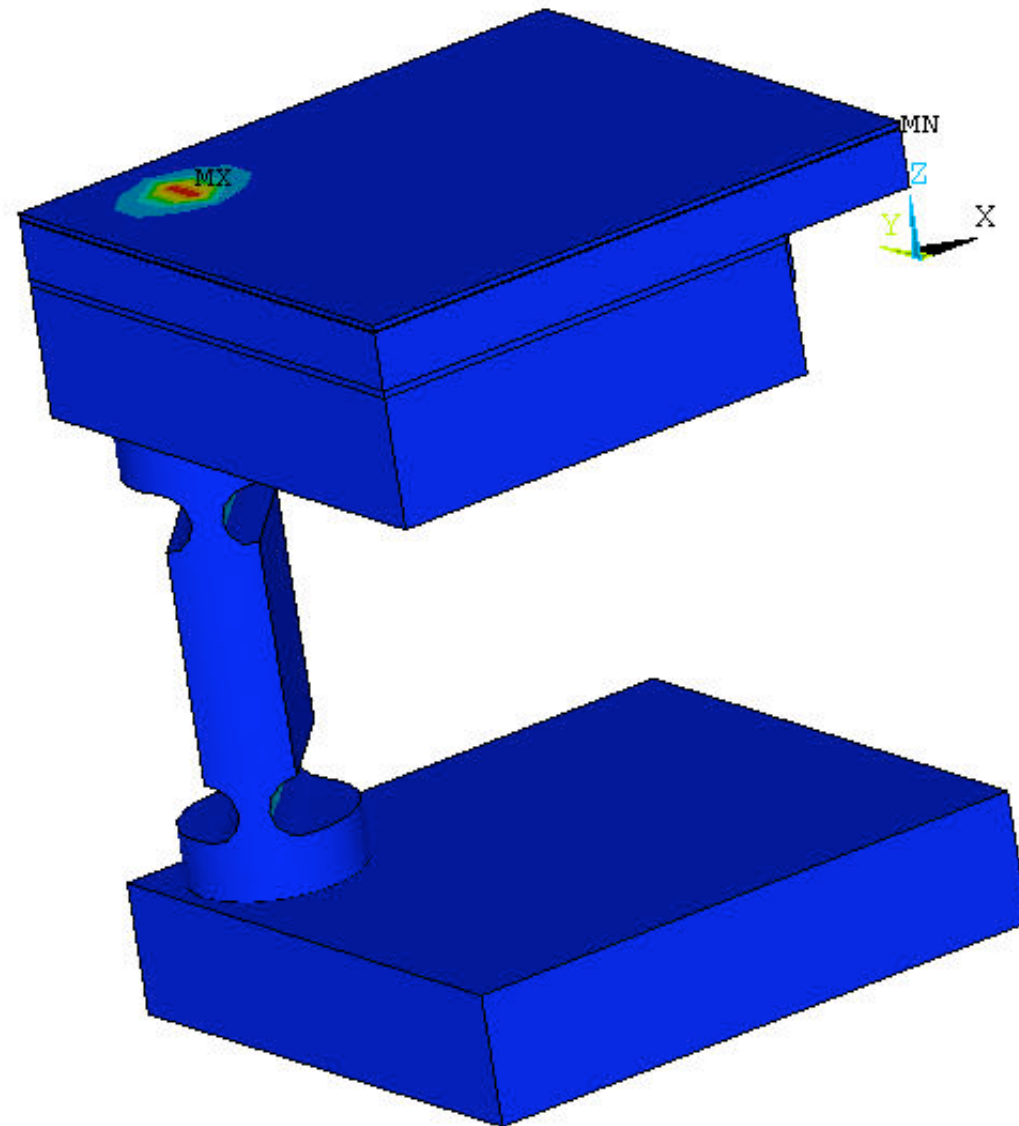
SMN =.125E-08

SMX =.108865

ANSYS

JUL 3 2003

11:33:17



Thermal AlN/Invar36 SNAP CCD Blade Mount, .01W, 140K

1

NODAL SOLUTION

STEP=1

SUB =1

TIME=1

USUM (AVG)

RSYS=0

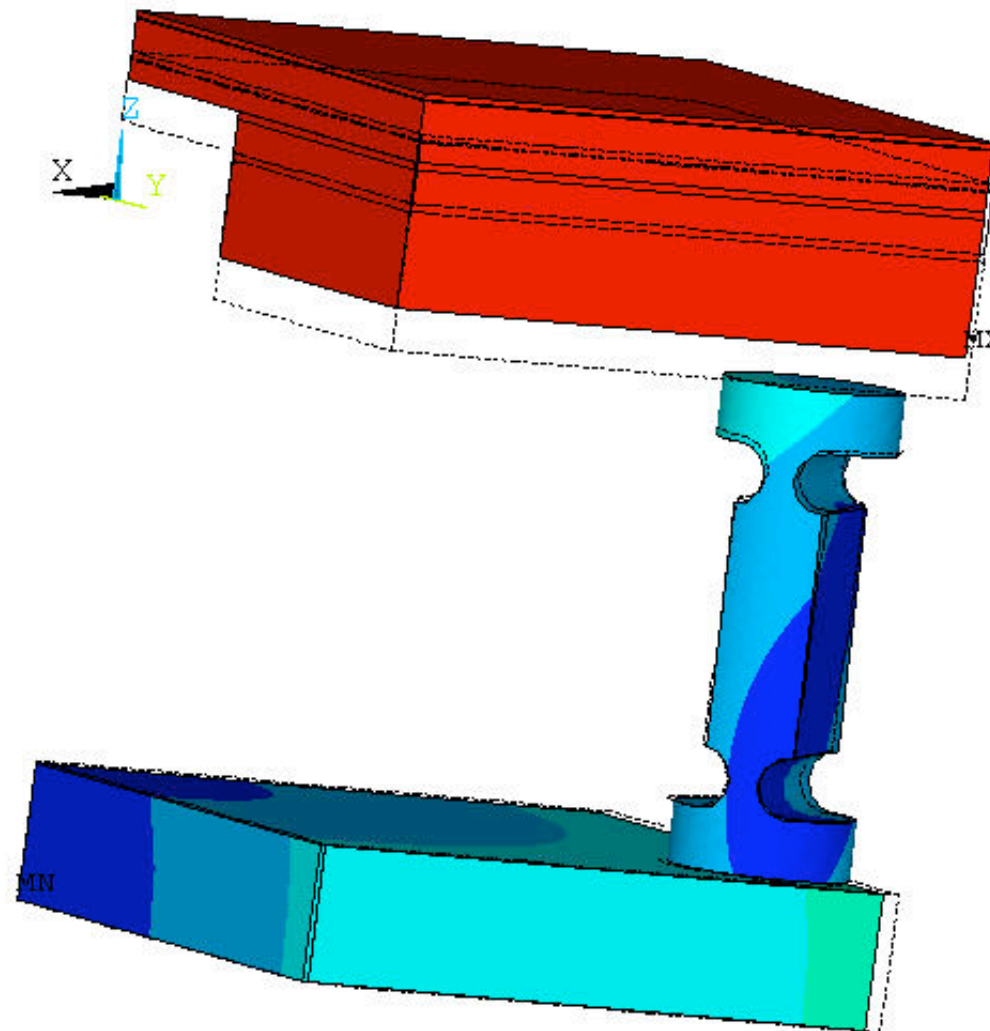
DMX =.056887

SMX =.056887

ANSYS

JUL 3 2003

12:07:32



Structural Thermal AlN/Invar36 SNAP CCD Blade Mount, .01W, 140K